great town then possessed; Arago, Dulong, Fresnel, Fourier, Ampère. He made true friends with many of them, and had the honour of being a fellow-worker of the two last. At Paris he found the old friend of his childhood, Sturm, with whom, in 1826, he made the wonderful experiments on the Lake of Geneva, relating to "the velocity of sound in water," which united their two names so admirably in all treatises on physics, and which won for them the grand prize of the Institute of France.

By the side of these classical researches, Colladon's first works deal chiefly with electricity. In 1826 he published his experiments made at the College of France, with a galvanometer of his own invention, on the magnetic actions which ordinary electrical machines, Leyden batteries, and atmospheric electricity produce on the magnetic needle. He studied the electrodynamic actions with Ampère, and the conductivity of thin bodies for heat with Fourier.

The celebrity which he had acquired for himself at Paris by his works led to his being asked by the founders of the Central School of Art and Manufacture to join them, and to give a special course of lectures on the steam-engines and their use, which he did with much success from 1831 to 1834. He also made numerous researches and inventions relating to steam-engines. In 1844 the Lords of the English Admiralty adopted a dynamometer which he invented to measure the effective power of steam-engines for navigation, and which he was charged to make at the Royal Arsenal of Woolwich at the cost of the Admiralty.

In spite of the honourable place which he had attained at Paris in the world of science and industry, Colladon, was so attached to his country, that he gave up the many advantages which would accrue from a residence in France, and settled at Geneva in 1834. He proved himself on many occasions most useful in the debates of the little Republic, and was made Professor of the Academy in 1839.

In 1852 he rendered to the industry of his country the great service of representing it at the first Universal Exhibition in London, where he was delegated by the Federal Council as Commissioner for Switzerland.

He took part in two juries relating respectively to physical instruments and clocks. The most diverse branches of industry excited the interest and research of his fruitful mind. One to which he gave most of his attention was illumination by gas. In 1844 he was appointed engineer of the new gas company at Geneva. He invented a great number of improvements in gas-lighting, and the wonderful competence that he acquired has contributed largely to establishing a great number of enterprises of the same sort both in Switzerland and abroad. It was on this account that he was charged to superintend the installation of the Gas Society at Naples.

Hydraulics occupied him on many occasions; he studied the water supply of towns, and invented floating hydraulic wheels with the paddles below. It was he who discovered the ingenious way of lighting a liquid tube from within, by introducing, as it were, with the water a luminous ray, which remains imprisoned by the effects of totally multiple reflections, and illuminates the whole length of the liquid cylinder. The luminous fountain, or, as it is often called, "the Colladon fountain," originated from this delicate experiment. It formed one of the most beautiful ornaments at the Universal Exhibition at Paris, and was tried on a larger scale for the first time at the exhibition of Glasgow in 1884.

But these are not the inventions which render great the name of their inventor; the one which merits this honour, and to which the name of Colladon must ever be united, is that of the use of compressed air for the transference of energy. Profiting by the resources which he had at his disposal as engineer of the gas works at Geneva, from 1849 he made essays on the circulation of compressed gas in pipes, and he demonstrated the possibility of transmitting with economy a considerable energy for a long distance in narrow pipes. It is easy to understand the immense importance in the construction of long tunnels of transmitting energy by compressed air, for with the impulse given to the boring machine, fresh air is brought at the same time to the workmen at the end of the deep galleries. It is this idea, as simple as it is beautiful, which constitutes Colladon's claim to glory; this invention which must immortalise his name: it is this which makes it possible to construct the great subterranean passage which honour our generation, and which have made him one of the benefactors of our time. After the first studies for the tunnel of Mont Cenis, in December, 1852, he gave an excellent memoir on the subject to the Financial Minister of the Italian State, which was followed by a request for a patent for the new processes.

This important memoir, transmitted by the Italian Government to the Royal Academy of Science at Turin, was the object of a special report addressed to the Minister, and it concluded thus:

"The author does not limit his memoir to a simple description of the proposed scheme, but he shows the applicability by theoretical considerations. The commission recognises above all the vast importance the inventions of Monsieur Colladon could be in hastening the construction of the railways destined to cross the Alps." The splendid invention of Colladon was applied with much success by the Italian engineers at the construction of the Mont Cenis tunnel, and it made its reputation there, but all the honour belongs to the discoverer. If Colladon had not the pleasure of making the first applications of his invention, and if he had to leave to others the honour of making the first sub-alpine tunnel, he was able at least to give his ideas full development in the making of the St. Gothard tunnel, by the installation of the powerful compressors at Goeschenen and Airolo, which he executed for the enterprise directed by L. Favre.

Colladon was one of the first specialists in the art of constructing tunnels. It is owing to this that in 1878 he was made a member of the committee connected with the tunnel under the Channel. He was also very busily occupied studying out the boring of the Simplon.

We cannot in this short notice give a complete idea of the greatness, and fruitfulness of Colladon's career. Suffice it to mention his researches on the electricity of the torpedo, atmospheric electricity, the effect of lightning on trees, snow and hail, waterspouts, the use of steam for putting out fires, and on the terraces surrounding the Lake of Geneva.

Colladon had such a many-sided mind, that he could interest himself with the most diverse questions, and he studied them all with remarkable care and conscientiousness. Absolutely disinterested, he worked for the advancement of science, without pushing his inventions for his own profit. On the contrary, he was always at the service of others, and always ready to help them with his advice and assistance without any remuneration.

He was a great worker and was willing to assist others until the last years of his admirable life. He died at the age of ninety-one, preserving nearly to the last the use of his fine and noble faculties. His reputation had extended itself far and wide, and a great number of learned societies of all parts of the world counted him among the number of their members.

ED. SARASIN.

NOTES.

WE learn that Dr. J. W. Gregory arrived at Mombasa on August 19, after a successful expedition to Lake Baringo. He returned *via* Likipia and Mount Kenia, and ascended the latter to a height of more than 17000 feet. Dr. Gregory has explored the glaciers and the head-streams of the Tana, and the water-sheds between the Tana and Athi rivers.

THE death is announced of Prof. G. W. Coakley, who for thirty-three years occupied the chair of mathematics and astronomy in New York University. He was born on the island of St. Bartholomew on February 22, 1814, entered Rutgers College in 1832, and graduated in 1836. In 1843 he was made professor of mathematics and astronomy in St. James's College, Indiana, where he remained until 1860, when he accepted the same professorship in New York University, filling the chair vacated by Prof. Loomis, who had gone to Yale University. He held this chair in New York University until his death, and was engaged in active teaching until his 77th year.

A REUTER'S telegram from Halifax, Nova Scotia, states that a terrific hurricane swept over the Maritime Provinces on August 21, and was the worst that has occurred since the great storm thirty years ago. In Halifax a vessel was sunk in dock, trees were uprooted, and the electrical systems were wrecked.

ON August 25 Prof. J. Victor Carus, the editor of the *Zoologische Anzeiger*, will celebrate his seventieth birthday. In honour of the occasion, the current number of that journal contains a remarkably fine portrait of the renowned zoologist.

THE Board of Agriculture notify that arrangements have recently been made by which the latest issues of the Ordnance Survey maps on the 1 in. and 6 in. scales have been made available for inspection by the public at the offices of the Board, at 3, St. James's Square. Changes in the boundaries of boroughs, of local government districts, and of parishes will be recorded on the 6 in. maps as soon as possible after they have been authorised, and a complete set of the index maps and indices of all Ordnance Survey maps and publications will be kept in hand for reference. It is believed that the facilities for inspection thus afforded will be found to be of general public utility.

THE *Times* gives some details received from Japan with regard to the recent volcanic eruptions in the Fukushima district, in the mountains of which Bandaisan, where there was a destructive eruption a few years ago, is the chief. The disturbances began with an earthquake early in the afternoon of June 4, which was followed by an eruption of Azuma-Yama the next morning. Other peaks in the neighbourhood became active, and the showers of stones and ash did much damage, especially to the mulberry trees of the district. It was decided to investigate the mountains, and two members of the geological bureau of the Agricultural Department were despatched from the capital for the purpose. They ascended Azuma-Yama very early on the morning of June 6 with the view of making observations in the immediate vicinity of the craters, and the same night reported to the authorities in the capital that, when they ascended, volcanic ash was falling and strong puffs of black cloud were escaping from time to time. They were able to make a circuit of the craters, from one of which dense volumes of vapour and ash were being emitted and from another heated air only. Whenever part of the sides gave way and fell in, the volume of vapour increased and a rumbling noise was heard. Heated fragments of rock were thrown out from time to time. On the morning of June 7 two students of the University of Japan and two engineers ascended the volcano. A violent eruption occurred while the party were approaching the crater. A dense column of gas arose, and was accompanied by a shower of rock fragments. After the explosion it was found that the two engineers had been overcome by the fumes. Attempts were made to rescue them, but they unfortunately failed. It was not until the following day that the neighbourhood of the crater could be searched and the bodies recovered.

THE *Journal* of the College of Science, Imperial University, Japan, Vol. V. Part IV., contains a paper by Prof. B. Koto "On the Cause of the Great Earthquake in Central Japan, 1891." Prof. Koto has examined a great line of fault which traverses a distance of 112 kilometres from the Kisogawa to the city of Fukui, through the Neo valley, cutting the hills, mountains, and plains alike with remarkable regularity and sharpness. He is of the opinion that the entire region on one side of the line of fault moved downwards in October, 1891, and was also shifted horizontally towards the north-west for from one to two metres along the plane of dislocation, thereby causing the earthquake.

MR. J. D. MCGUIRE has, during the last two years, been endeavouring to reproduce aboriginal methods of work, chiefly in stone, with tools of stone, wood, and bone, such as are found in village sites in America and Europe, as well as with tools found in graves, and those used by races living in savagery. He describes his experiments in a paper "On the Evolution of Working in Stone," that appeared in the *American Anthropologist* for July. The experiments show that the art of grinding and battering stone must have preceded that of chipping, and that neolithic implements which are supposed to have taken years to fashion were really but the work of a few hours.

WRITING in the *Journal* of the Polynesian Society, Miss Teuira Henry, of Honolulu, says that a strange ceremony used to be practised by the heathen priests at Raiates, but can now only be performed by two descendants of priests, Tupua and Taero by name. This ceremony consisted in causing people to walk in procession over a hot earth-oven, without any preparation upon their feet, whether barefooted or shod, yet upon their emergence they did not even smell of fire. The ovens are frequently thirty feet in diameter, and are filled with roots of the *ti*-plant (*Dracaena terminalis*) and short pieces of *ape*-root (*Arum costatum*). It is hoped that some one will endeavour to solve the mystery of the feat while those men who practise it still live.

THE U.S. National Museum have published a report by Mr. Romyn Hitchcock on "The Ancient Burial Mounds of Japan," illustrated by ten excellent plates, mostly reproduced from original photographs. Mr. Hitchcock visited Japan with Mr. W. Gowland, who has spent several years in the study of the Japanese mounds. One of the earliest modes of burial in Japan was in artificial caves, hewn out of the solid rock on hill-sides. It has been said that the early Japanese were cave-dwellers, but Mr. Hitchcock thinks this is very doubtful, for the reason that natural caves are not found where the history of the people begins, in Idzumo and Yamato. The examination of both natural and artificial caves indicates, at any rate, that the Japanese have not been cave-dwellers since their migration to Japan. Four distinct methods of burial have prevailed in Japan at different periods, which are distinguished by Mr. Hitchcock as follows :—(1) Burial in artificial caves. (2) Burial in simple mounds of earth. (3) Burial in mounds with rock chambers, or dolmens. (4) Burials in double mounds, or imperial tumuli. The chronological sequence of these different modes of burial is a matter of speculation, but, in all probability, the caves preceded in time the rock-built dolmens. No inscription remains, however, to enable ethnologists to solve the origin of the custom of cave-burial. A variety of articles were obtained from the mounds by Mr. Hitchcock, notably vessels of pottery of various shapes, illustrations of which accompany his report. The forms and style of decoration of these vessels are very rude ; in fact it is pointed out that the decoration is much less elaborate than that found on the older pottery of the shell-heaps and pits of Yezo, and usually designated as Aino pottery. As Mr. Hitchcock remarks, it is difficult to explain the curious anomaly that the early pottery of a people who are famed at the present day for their productions in this kind of handiwork, should be inferior to the earlier productions of their predecessors, who have since absolutely lost the art of making pottery of any kind.

IT was Lœffler who most successfully exhibited in stained preparations the cilia or organs of locomotion attached to some micro-organisms. As is well known, these appendages will not stain in the usual manner, and special methods have to be adopted. Moreover, they are so delicate and easily broken or detached that the greatest care and skill have to be exercised in their demonstration. Lœffler's method consists in using a mordant, to which a certain proportion of either an acid or alkali is added, the nature as well as the proportion of the latter varying with the particular microbe under investigation. To ascertain the exact quantity required in each case is of course a very tedious process, but recent investigations have shown that the acid or alkaline reaction of the mordant may be neglected, and that equally successful specimens can be prepared when this precaution is altogether omitted. A very simple modification of Lœffler's method devised by Nicolle and Morax is published in the *Annales de l'Institut Pasteur*, July 1893, p. 554. These authors dilute a small quantity of a recent culture in water, and run a fraction of it on to cover-glasses and allow it to dry. Lœffler's fuchsin ink or mordant is then applied, heated over a small flame until it begins to steam, and then washed. This process is repeated three or four times, after which the preparation may be stained with an ordinary aqueous solution of violet and examined in the usual manner. It is stated that by thus substituting the application of the mordant three or four times for the once recommended by Lœffler, equally good results were obtained without the addition of either an acid or alkali.

AN elaborate investigation into the chemical and bacterial condition of the river Elbe at Magdeburg has been recently carried out, and the results are published in the part issued in July of the *Arbeiten a. d. Kaiserlichen Gesundheitsamte*, vol. viii. 1893. The Elbe at the intake of the Magdeburg water-works contained on November 10, 1891, as much as 34·3 parts of chlorine per 100,000. This large proportion of chlorine sinks into insignificance when contrasted with the 130·3 parts per 100,000 present in the Saale one kilometre above its junction with the Elbe. The Saale receives the drainage from numerous potash and other works, and the waste water from one of these was found to contain as much as 656·4 parts of chlorine per 100,000, so that the brackish state of both these rivers is easily explained. Ohlmüller, who is responsible for the report, states that unless the intake of the Magdeburg water-works is removed to a more suitable spot there is every probability of the Elbe water becoming undrinkable, in spite of the exhaustive and careful filtration to which it is submitted before distribution, in consequence of its brackish taste. But another consideration also enters into the question of the desirability of this water for dietetic purposes, for the saline condition of a given water acquires a new significance since the important discovery that the cholera organism thrives luxuriantly and multiplies abundantly in water and other media containing a high percentage of salt. That the water of the Elbe remains brackish even when it reaches Hamburg was shown by chemical analyses made of this water during the cholera epidemic last year, and Percy Frankland states (*British Medical Journal*, July 29, 1893, p. 251) that he found 31·3 parts of chlorine per 100,000 in the sample which he examined. Hueppe, in his report on the Hamburg epidemic, mentions especially the salt taste which the water had. That other bacteria can also flourish in this brackish water is exhibited by the large numbers present in the Saale, there being as many as 40,440 in 1 c.c. of water abstracted about one kilometre above the point where this river joins the Elbe.

HERR A. HASEMANN suggests, in the current number of the *Zeitschrift für Instrumentenkunde*, a novel suspension for pendulums which appears to merit some further investigation. In the ordinary suspension of a knife-edge turning on a plane, a high magnification would show us a flattened cylinder working in a depression in the plane due to the elastic yielding of the material. This introduces friction and the sliding action discovered by Defforges. Herr Hasemann proposes to rest the knife-edge upon another, or rather to give both the knife-edge and its support a semi-cylindrical form. In that case the junction of the two surfaces is a plane, and for the same angle of swing the displacement of the surface of contact is much smaller. In the experiments undertaken to test this arrangement, the difficulty anticipated with regard to stability was found to be very much less than one might be led to suppose.

LORD KELVIN'S new series of electrical measuring instruments are described by Mr. Andrew Meikle in the *Electrician*. The chief representatives of this class of instruments are the recording electricity meter and the dial voltmeter. In the former, which is chiefly intended to measure the energy consumed in electric-lighting circuits, the whole current is sent through a stout coil consisting of a few turns of a copper spiral. Within this coil is suspended a vertical electromagnet made of a soft iron core wound with wire conveying a subsidiary current of $\frac{1}{40}$ ampere, which is 25 per cent. more than is sufficient for saturation. The position of this electro-magnet within the coil is recorded by an intermittent counting mechanism worked by a cam. The large dial voltmeter made for the Edison Electric Illuminating Company, of New York, depends upon the pull of a solenoid upon a suspended electromagnet as in the first instrument, but here the electromagnet is wound with 30,000 turns of fine copper wire, the current under investigation being conveyed to the coil by the spiral springs by which it is suspended. The resistance of the electromagnet coil is 1500 ohms, and the core is saturated by $\frac{1}{25}$ ampere. Electromotive forces of 60 volts and upwards are therefore measured free of residual errors. Attached to the electromagnet is a ratchet which is geared into a pinion wheel on the shaft carrying the pointer, thus giving the instrument a great resemblance with the aneroid barometer. A rod carrying two discs is screwed into the lower end of the electromagnet, and the discs, working in thick oil in a dash pot, serve to damp vibrations due to sudden changes of electromotive force. The diameter of the dial is about thirty inches.

M. D'ARSONVAL, we learn from *Électricité*, has been making experiments on the electric excitability of muscles after death, and recently sent some results of his observations to the Academy of Sciences. General opinion on this point agreed that the excitability disappeared very soon after the death of the animal, which is true only so long as one depends upon the shortening of the muscle for an indication of its sensibility. But this method is not sensitive enough to indicate disturbances of very small amplitude. For this purpose M. d'Arsonval has for many years used a special modification of the microphone, which he has named the *myophone*, and which, when it is connected with the muscle under experiment, gives a sound some time before any contraction is apparent, especially if the muscle is stretched by a spring. By this means it may be proved that nervous excitability may last for many hours after death. As an instance, the achilles tendon of a rabbit may be attached to the myophone, and the sciatic nerve excited by a current broken some 50 to 100 times per second. Besides proving that the death of a nerve is much less rapid than was hitherto supposed, these experiments also show that nerve may act on muscle without producing actual contraction, but only some simple molecular vibration.

WE have received a catalogue of the library of the Akademie der Naturforscher, prepared by Dr. Oscar Grulich.

THE City and Guilds of London Institute for the advancement of technical education has issued its programme of the technological examinations for the session 1893-94.

"SYMONS'S BRITISH RAINFALL" for 1892 has been published. It contains, in addition to the rainfall statistics gathered from more than three thousand observers in Great Britain and Ireland, several articles upon various branches of rainfall work.

A LECTURE on "Cholera Prospects and Prevention," recently delivered by Dr. Thorne Thorne, F.R.S., to the technical teachers of the National Health Society, has just been published by the Society. The teachers and the Society must benefit by putting themselves under such an excellent adviser as Dr. Thorne is upon hygienic matters.

THE autumn session of popular science lectures at the Royal Victoria Hall, Waterloo Bridge-road, will open on Tuesday, September 5, with a lecture on "What I saw of New Zealand and the noble Maori," by Capt. Chas. Reade, R.N. The three other lectures of the month will be given by Prof. Malden, and will be as follows:—September 12, "Picturesque Ireland;" September 19, "Australia;" September 26, "The World's Fair and Chicago."

THREE more volumes of the comprehensive Aide-Mémoire series, published by Gauthier-Villars and by Masson have been received. One, by M. Laurent Naudin, is on the manufacture of varnishes. It is divided into two parts, dealing respectively with the physical and chemical properties of the materials used, and with the actual processes involved, in varnish manufacture. M. G. Laverque is the author of a volume on turbines, which is also divided into theoretical and practical parts. The third volume is by M. A. Hébert, and deals with the means of detecting the adulteration of alcoholic drinks.

THE Journal of the Marine Biological Association (vol. iii., No. 1) contains lists of the *Nemertines* of Plymouth Sound, by Mr. T. H. Riches, and the *Turbellaria* of Plymouth Sound and the neighbourhood, by Mr. F. W. Gamble. Dr. Benham contributes a paper on the post-larval stage of *Arenicola marina*, and Mr. E. W. L. Holt continues his description of the North Sea investigations carried on by him at the Marine Fisheries Society's laboratory at Cleethorpes. Mr. J. T. Cunningham contributes two interesting articles on the immature fish question, and the coloration of the skins of flat fishes.

THE United States National Museum has issued in separate form the report of Dr. J. P. McMurrich on the Actiniæ collected by the U.S. Fish Commission steamer, *Albatross*, during the winter of 1887-88. The reports deals with the Edwardsiæ, Protactiniæ, Hexactiniæ, and Ceriantheæ. Dr. McMurrich will give the results of his studies of the Zoantheæ in a future report. Other recently-received excerpts from the Proceedings of the U.S. National Museum include a "Description of some Fossil Plants from the Great Falls Coal Field of Montana," by Mr. W. M. Fontaine, and a paper "On the Occurrence of the Spiny Boxfish (Genus Chilomycterus) on the Coast of California," by Prof. Carl H. Eigenmann.

AN improved mode of preparing the ammonium salt of persulphuric acid, NH_4SO_4 or $(NH_4)_2 S_2O_8$, is described by Dr. Elbs, of Freiburg, in the latest number of the *Journal für Praktische Chemie*. The potassium, ammonium and barium salts of persulphuric acid were obtained two years ago by Dr. Marshall, of Edinburgh, in large well-developed crystals as described in our note of Vol. 44, p. 577, and since the publication of Dr. Marshall's memoir M. Berthelot, who first pointed out the existence of the acid and its anhydride, has published an account of his further experiments upon the subject, fully confirming the results obtained by Dr. Marshall, and adding further details. M. Berthelot's latest form of electrolytical apparatus for the preparation of the persulphates by the electrolysis of solutions of the ordinary sulphates in sulphuric acid consisted of a double cell, the inner portion being constructed of porous porcelain. Into this inner porous cell of about 150 c.c. capacity was placed a concentrated solution of ammonium or potassium sulphate in dilute sulphuric acid, while the outer cell was filled with more of the dilute acid. M. Berthelot appears to have considered it essential to employ an anode of small surface in the inner cell, a piece of stout platinum wire being preferred; but a kathode of large surface was considered requisite in order to diminish the resistance of the arrangement, and a large plate of platinum was employed for this purpose. A current of three amperes was allowed to pass through the apparatus for fifteen to twenty hours, when a yield of about forty to forty-five grams of ammonium persulphate, corresponding to a yield of sixteen *per cent.* of the theoretically possible, was obtained. With the improved form of apparatus and under the conditions described by Dr. Elbs, it is possible to obtain an average yield of sixty-five *per cent.* of ammonium persulphate, the amount having even reached eighty-five *per cent.* in one experiment. As anode or positive pole a spiral of platinum wire is employed, and as kathode or negative pole a piece of sheet lead bent into a cylindrical form and surrounding the inner porous cell. The outer liquid consists of equal portions by volume of water and oil of vitriol, and the inner liquid is a saturated solution of ammonium sulphate in sulphuric acid diluted with eight times its volume of water. The apparatus is cooled during the passage of the current by a bath of pounded ice. If cold spring water is available, however, the cooling may conveniently be effected by substituting for the leaden cylinder in the outer vessel a worm of leaden tubing, through which the cold water is driven. The current of two to three amperes is only permitted to traverse the apparatus for three or four hours, when the contents of the inner cell are filtered through glass wool, which retains in the funnel the crystals of ammonium persulphate produced. The crystals are drained on porous plates, and the filtrate is again saturated with sulphate of ammonia, returned to the inner cell, and again electrolysed. There is no advantage in prolonging the experiment to twenty hours, inasmuch as the formation of persulphate occurs much more slowly after a time. After the first experiment, when a considerable quantity of ammonium persulphate remains in solution, one hundred parts of water at the ordinary temperature dissolving sixty-five parts of the salt, about forty grams of crystals are obtained in each operation of three to four hours. In order to recover the persulphate remaining dissolved after the conclusion of the preparations it is convenient to precipitate it as the potassium salt by the addition of a solution of carbonate or acetate of potassium. Potassium persulphate is much less soluble than the ammonium salt, one hundred parts of water, under the same circumstances as mentioned in the case of the latter salt, only dissolving two parts of the potassium salt. It would thus appear to be most advantageous to prepare the soluble ammonium salt as the starting-point for a study of the persulphates, and the method described by Dr. Elbs renders the operation both simple and cheap, and affords it in comparatively large quantities in a short period of time. The product may be purified from traces of admixed ordinary sulphate by first recrystallising a small portion, and subsequently washing the main quantity with the solution of the pure crystallised salt. Recrystallisation of the whole is attended with a considerable loss. The crystals are quite permanent, however, when stored in dry bottles with well-fitting stoppers.

NOTES from the Marine Biological Station, Plymouth.—Last week's captures include the Anthozoan *Gephyra Dohrnii*, the Æolid *Amphorina cœrulea*, the Cirrhipede *Scalpellum vulgare*, and the Brachyura *Ebalia tumefacta* and *Achæus Cranchii*. The floating fauna continues to be rich in trochophore larvæ of various types, as recently recorded; the larva of *Polygordius* was last week taken in addition. Among Protozoa, *Noctiluca* has become more plentiful; but the week has been especially marked by the presence of Radiolaria of several species in numbers altogether unprecedented in our experience. Other signs of an Atlantic element in the floating fauna of late are furnished by the continued abundance of the Siphonophore *Muggiæa atlantica*, both colonies, eudoxomes and larvæ, and by the capture of two specimens, sexually mature, of *Doliolum Tritonis*. The Hydroids *Aglaophenia pluma* and *myriophyllum* and the Nudibranch *Æolidiella Alderi* are now breeding.

THE additions to the Zoological Society's Gardens during the past week include a Mona Monkey (*Cercopithecus mona*) from West Africa, presented by the Misses Price; a Yellow-cheeked Lemur (*Lemur xanthromystax*) from Madagascar, presented by Miss Annie Gervers; a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mr. J. W. Harris; a Short-toed Eagle (*Circaëtus gallicus*) from Morocco, and six Little Bitterns (*Ardetta minuta*) from Europe, presented by Lord Lilford; a Black-headed Gull (*Larus ridibundus*) from Brit. Isles, presented by Mrs. H. S. Wardrop; an Indian Kite (*Milvus govinda*) from Eastern Asia, presented by Mr. A. Savory; four Tortoises (——) from Formosa, presented by Mr. P. Aug. Holst; a Golden Cat (*Felis moormensis*) from Sumatra, a Slender-billed Cockatoo (*Licmetis tenuirostris*) from South Australia, and six Avocets (*Recurvirostra avocetta*) from Holland, deposited; six Avocets (*Recurvirostra avocetta*) from Holland, a Common Tern (*Sterna hirundo*) from Holland, a Japanese Ape (*Macacus speciosus*) from Japan, and a —— Hawk Eagle (*Spizaëtus* ——) from India, purchased.

OUR ASTRONOMICAL COLUMN.

THE CORDOBA DURCHMUSTERUNG.—Mr. John Thome, the Director of the National Argentine Observatory, is to be congratulated upon the publication of the Cordoba Durchmusterung Catalogue, containing the brightness and position of every fixed star down to the tenth magnitude comprised in the belt of the heavens between 22° and 32° of south declination. The results are a continuation of the Durchmusterungs of Argelander and Schönfeldt from their southern limit. In the present volume 179,800 stars are catalogued, but altogether the places of 340,380 stars have been determined down to − 42°. The observations for this great catalogue were begun in 1885 and ended early in 1891. They reach the enormous number of 1,108,600, and were made entirely by Mr. Thome and Mr. R. H. Tucker. The area over which the observations have extended is 6075 degrees of a great circle, hence the mean density of stars is 56·2 stars per square degree. The corresponding mean density for Argelander is 15·2, and for Schönfeldt 18·5. The density varies considerably, however, in different parts of the sky, and ranges from 70 to 160 stars per square degree in the Milky Way. Mr. Thome says that a series of twelve maps, each embracing two hours of right ascension and twenty degrees in declination, has been constructed upon the scale adopted by Argelander, and will be issued during next year with the second volume of the catalogue, containing stars within the belt from 32° to 42° south declination. The construction of these maps, and the preparation of a catalogue like that of which the first part has just reached us, involves an enormous amount of labour. Indeed, it is difficult to understand how, amidst the vicissitudes to which an observatory in the Argentine Republic must be subject, and with such a meagre staff as that under Mr. Thome's direction, it has been possible to do so much excellent work.

THE RORDAME-QUÉNISSET COMET.—On July 11 the Rordame-Quénisset comet (*b* 1893) was photographed at Goodsell Observatory, and a fine photogravure reproduction of one of the views forms the frontispiece to the August number of *Astronomy and Astro-Physics*. In a letter that appears in the same journal, Prof. J. E. Keeler describes the spectroscopic observations of the comet made at Alleghany Observatory. On July 10 the three usual carbon bands were seen, connected by a narrow continuous spectrum from the nucleus. Each band appeared to terminate sharply on its less refrangible side, where also the brightness was greatest. No direct comparison of spectra could then be made, so the positions of the bands were estimated. A photograph of the comet spectrum in juxtaposition with the solar spectrum obtained from the moon was procured on July 19. Upon the photograph could be seen a hazy band at λ 472 and another terminated by a line on the less refrangible side at λ 388, and fading away towards the more refrangible end of the spectrum. Between these two bands others were suspected, but could not be made out with sufficient accuracy for a determination of wave-length. A comparison of the spectrum of the comet with that of a spirit lamp on July 20 showed that the bands were coincident in the two spectra. The brightest comet band—that in the green—appeared to have a second maximum coincident with the second maximum of the corresponding carbon fluting

A SIMPLE EQUATORIAL MOUNTING.—M. J. Jarson describes in *L'Astronomie* for August a simple, if not new, means by which small telescopes can be moved equatorially, thus permitting an observer to keep objects in the field of view without constantly moving the telescope in altitude and azimuth. Applying this method, for instance, to a small telescope mounted on a small vertical tube, tripod fashion, such as those generally used at seaside resorts, the following account may show the simplicity of the arrangement. On the stand of the telescope a bar of wood or of iron is fixed horizontally, in which is a hole sufficiently large to pass a cord. The position of the hole is determined by the rule that the line joining the centre of motion of the telescope in declination to this hole makes an angle with the horizontal bar equal to the latitude of the place of observation. By connecting the object-glass end of the telescope to this hole, by means of a chain or cord, any celestial object can be followed in the heavens by simply keeping the cord tight and moving the telescope. A weight fastened to the eye end secures the tightness of the cord. The telescope will then describe an arc of a circle in the heavens, and not a straight line as formerly. For different objects it is obvious that one must vary the length of the cord; but for making prolonged studies of any particular one possessors of small instruments will find this a most useful arrangement.

A REMARKABLE SOURCE OF ERROR.—Dr. E. Von Rebeur-Paschwitz, in No. 3177 of the *Astronomische Nachrichten*, publishes some interesting curves traced by a horizontal pendulum during the prevalence of certain slight earth tremors occurring on different occasions and at different places. Traced photographically on sensitive plates moving with a velocity of twenty-four inches per minute, these tremors show a striking similarity to those observed by Prof. Milne in Japan. It appears that the surface of the earth is occasionally subjected to wave motions analogous to those disturbing a sheet of water, and often persisting with great regularity for several hours. Their connection with steep barometric gradients is probable, although that does not appear to be the only condition. In any case, the tremors appear in the presence of strong winds, at least in the neighbouring country, and they travel with at least the velocity of 2 km. per second. The influence of these tremors upon observations of polar distances, and upon spectro-photographic work, is sufficiently obvious to render it desirable that all observatories should be fitted with automatic instruments for registering these disturbances, and arrangements should be made for their study and comparison.

THE APEX OF THE SUN'S WAY.—In a letter to the editor of the *Bulletin Astronomique*, Prof. H. G. van de Sande Bakhuyzen says that he has determined the apex of the movement of our system from all Bradley's stars of which the distances from the pole of the Milky Way are less than 50°. In